Research and Development

科大作為一所研究型大學，在追求學問方面兼顧基礎和應用範疇，在技術創新方面與工商界緊密合作。本年度的成果不僅進一步確立科大作為一所國際級學府的地位，也為建設知識型社會作出了重要的貢獻。

As a leading research university, HKUST aims to pursue knowledge in both fundamental and applied areas, and collaborate closely with business and industry in promoting technological innovation and economic development. During the year, the University's achievements in research and development once again confirmed HKUST's position as a world-class tertiary institution and contributed to the region's transformation into a knowledge-based society.

學術研究

科大的學術研究在本年內繼續有驕人成績，並深受各界推崇。

在經濟學期刊《經濟研究》1999年10月號的一篇論文中，香港科技大學獲選

Academic Research

This year, HKUST's academic research work continued to score remarkable achievements and earn both local and international recognition.

In the October 1999 issue of *Economic Inquiry*, a

為東亞區內經濟學論文創作量最豐富的大學。此外，財經刊物《金融時報》在2000年1月24日發表全球商學課程排名調查結果：科大工商管理學院的研究產量排名40；該院的工商管理碩士課程也被選入首75名之內；科大是唯一入選該刊排名榜的亞洲學府。

科大四個學院本年內均有不少傑出的研究成果，以下是部分例子：

■ 數學系李衛平博士和美國密蘇里大學秦振波教授證明了Vafa與Witten關於S—對偶猜想中的一個公式，這項工作有助科學家了解代數曲面上向量叢模空間的幾何性質。

■ 物理學系湯子康博士及王寧博士成功研製世界上最細小的單壁納米碳管均勻陣列（見50頁圖），為一維系統電子特性的基礎和應用研究帶來新突破。
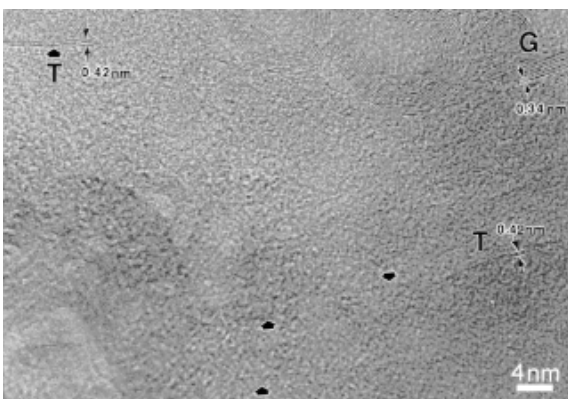
電子顯微鏡下的單壁納米碳管直徑只有0.4納米。
The 0.4nm single-walled carbon nanotubes under an electron microscope.

leading journal in the field of economics, HKUST was ranked the top university in East Asia in terms of research productivity in economics. In the *Financial Times* published on 24 January 2000, HKUST's School of Business and Management was ranked 40 among the world's top business schools in terms of research productivity; and its MBA program made the newspaper's top-75 list. HKUST was the only Asian institution selected for the list.

All four Schools of the University made outstanding achievements in research. The following are some examples:

■ Dr Wei-Ping LI of the Mathematics Department, in his joint work with Prof Zhenbo QIN of the University of Missouri, was successful in providing a mathematical proof of the blow-up formula of the S-duality conjecture formulated by Vafa and Witten. This is an important step towards understanding the geometric properties of the moduli spaces of vector bundles over algebraic surfaces.

■ Drs Zikang TANG and Ning WANG of the Physics Department successfully fabricated uniform arrays of the world's smallest single-walled carbon nanotubes (see picture on P.50). The results provided new leads in fundamental and applied research into the properties of electrons in one-dimensional systems.

■ Prof Ming Lei LIOU and Dr Oscar AU, together with PhD candidate Alexis TOURAPIS of the Electrical and Electronic Engineering Department, developed a fast motion estimation technique for effective compression of video data. The technique was recognized by the Motion Picture Experts Group as

■ 電機及電子工程學系劉名雷教授、區子廉博士及博士生Alexis Tourapis共同開發快速搜尋活動影像估計技術，獲活動影像專家組織選錄在第四系列標準(MPEG-4)之內，成為國際多媒體技術標準的一部分。

■ 土木工程學系陳俊文博士成功開發一套供高層樓宇設計應用的計算機輔助優化系統，不僅可以縮短高層樓宇的設計時間，還可以幫助工程師充分利用樓面面積和降低建造成本。

■ 資訊與系統管理學系系主任韋仕林博士和該系郭泰德博士合著的《全球電子商貿：理論與個案研討》已成為暢銷世界各地的電子商貿教科書。

■ 由社會科學部、經濟學系、技術轉移中心等學者組成的小組，為香港政府工業署設計合適的科技發展統計指標，讓研究人員和制訂政策者可以有適當的參考數據，評估香港的科技發展水平。

■ 人文社會科學學院兩個學部的學者在該院院長丁邦新教授領導下，與中國社會科學院合作開發漢藏語字彙系統數據庫，有助研究人員了解漢語和藏語的語源分類。

part of its MPEG-4 standard—a new global standard for multimedia applications.

■ Dr Chun Man CHAN of the Civil Engineering Department introduced an innovative computer-aided optimization system for the design of tall buildings. The system not only allows engineers to cut design time, but also enables them to maximize usable floor area and reduce construction costs.

■ Dr James C WESTLAND, Head of the Information and Systems Management Department, and Associate Professor Theodore CLARK of the same Department published an advanced postgraduate textbook entitled *Global Electronic Commerce: Theory and Case Studies*. It has since become one of the internationally best-selling textbooks on e-commerce.

■ Led by Dr Erik BAARK of the Social Science Division, a team of scholars from the Division, Economics Department, and Technology Transfer Center developed a set of science and technology indicators for the Industry Department of the HKSAR Government. The indicators will provide researchers and policy-makers with more appropriate information to assess the level of Hong Kong's development in science and technology.
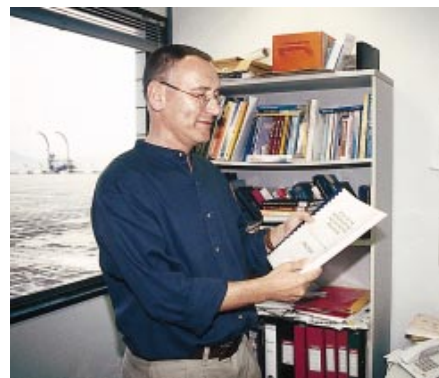
社會科學部寶克博士領導研究小組，為政府設計科技發展統計指標。
Dr Erik BAARK led a research team to develop a set of science and technology indicators.

應用研究及科技成果轉化

無論是基礎研究或應用研究，科大的著眼點在於研究項目是否與社會發展有密切關係。因此，科大的研究項目(例如上述的視像壓縮技術和高層樓宇設計技術)雖然有不少仍處於基礎研究的層面，但對工商界而言，已具備可觀的應用潛質。以建設社會作為選擇研究項目的參考準則，有助研究人員輕易地把成果轉化成應用研究項目，以至進一步開發成為產品或服務。

科大在1999-2000年度共有六項科研成果成功申請美國專利權，令大學所擁有的美國專利權數目達到23項；另外科大在本年內再提交了15項美國專利權申請。截至2000年6月底，科大共有53項專利申請正待審批。

本年度大學共批出八項專利授權，把科大的專利技術轉移給本地工商界。

除專利授權外，科大的教研人員還為社會各界(包括工商企業、政府單位、非牟利組織)提供不同形式的服務。例如：

■ 電機及電子工程學系主任陳正豪教授協助華科電子有限公司開發"倒扣芯片集成電路封裝技術"；該公司更因這項技術在1999年10月15日獲香港電子業商會頒授"傑出創意及技術產品銀獎"。

■ Led by Prof Pang-Hsin TING, Dean of the School of Humanities and Social Science, scholars in the two Divisions collaborated with the Chinese Academy of Social Sciences in the design of a database of lexical items from Sino-Tibetan languages. The database will help researchers understand the genetic classification of these languages.

Applied Research and Technology Transfer

One of HKUST's primary missions is to work on research projects that are closely related to the development of society. As a result, many research projects at HKUST, though fundamental in nature (examples include the video data compression technology and tall building design optimization system mentioned above), have often been regarded by industry as having high market potential. With contribution to society in mind, researchers readily convert their research achievements into applied projects, a further step towards the development of marketable products or services.

During the year 1999-2000, six US patents were granted to the inventions of HKUST researchers, bringing the number of registered patents owned by the University to 23. In addition, the University filed another 15 patent applications during the year. As of the end of June 2000, HKUST had 53 patent applications pending.

Over the past year, HKUST signed eight licenses transferring the University's innovative technologies to local industry.

Besides patent licensing, HKUST researchers also served the community (business, government, and non-

科大的分子神經科學研究中心與香港政府醫院管理局共同成立"香港腦神經科學聯盟"，為本港科學家和醫護人員提供卓越的教育、培訓、科研和臨床實習機會。

工商管理學院為行政人員開辦"電子商貿的要素"研習班，向本地行政人員扼要介紹電子商貿的重要，以及如何開展這種新的貿易方式，提高競爭力。

吳家瑋校長與醫管局行政總裁何兆煒簽署合作協議。
President Chia-Wei WOO and Hospital Authority Chief Dr William HO signed a collaborative agreement on the Neuroscience Alliance of Hong Kong.

機械工程學系余同希教授為香港政府職業安全健康局進行有關安全帽的測試，為職業安全作出貢獻。

研究開發資助

在1999-2000年度，科大研究人員提出的新研究項目共收到2.802億港元資助，較去年上升了25%；主要增長來自與工業界有關的研究項目。

持續進行的研究項目中，約四成來自香港政府研究資助局(研資局)，創新及科技基金佔31%，私人機構佔17%，香港政府大學教育資助委員會則佔11%。

profit organizations) in various other capacities. For example:

Prof Philip CHAN, Head of the Electrical and Electronic Engineering Department, helped the Hua Ko Electronics Co Ltd develop flip-chip integrated circuit packaging technology. On 15 October 2000, the Company won the "Outstanding Innovations and Technological Products Silver Award" from the Hong Kong Electronics Industry Association for the technology developed.

HKUST's Molecular Neuroscience Center and the Hospital Authority of the HKSAR Government joined hands to establish the Neuroscience Alliance of Hong Kong, which provides scientists and clinicians with opportunities in further education, training, research, and clinical practice.

The School of Business and Management launched "The Essence of E-business for Executives", a program designed to keep local executives abreast of the latest developments in e-commerce and help them manage this innovative business-transaction method in order to enhance their organizations' competitiveness.

Prof Tongxi YU of the Mechanical Engineering Department undertook the Occupational Safety and Health Council's safety helmet testing project, thereby making an important contribution to local occupational safety.

在競逐研資局撥款方面，科大本年度繼續在申請成功率(58%)上遠遠領先本港其他院校，共有150個項目獲得該局資助，總額為7,664.3萬港元。

此外，本年度獲得的研究經費中，有多項足以顯示科大的研究水平已達到國家和國際水平：

■ 研資局的合作研究中心計劃撥款964.6萬港元，資助科大與工業界合作進行四項大型研究項目：先進工程材料、互聯網、液晶顯示器及分子生物科技的技術開發。申請合作研究中心計劃的撥款必須得到工業界承諾提供最少20%額外資助。

■ 數學系杜強博士獲國家科技部聘任為第二批首席科學家之一，從事國家"973"重點基礎研究計劃中的"大規模科學計算研究"，首兩年的撥款總額超過1,300萬人民幣。

■ 中國國家自然科學基金委員會和研資局合辦的聯合科研資助基金，在本年度共撥出296萬港元和144萬人民幣，資助科大與內地合作夥伴進行四個研究項目，涉及的科研領域包括：納米材料、微電子、光電子學和海洋及環境科學。

Research and Development Funding

In 1999-2000, HKUST secured HK$280.2 million for new research projects, a 25% increase over the previous year. Most of this growth came from funding for industry-related research.

About 40% of on-going research projects was funded by the Research Grants Council (RGC); the rest being supported by the Innovation and Technology Fund (31%), the private sector (17%), and the University Grants Committee (11%).

In this year's Competitive Earmarked Research Grants program of RGC, HKUST continued, for the seventh consecutive year, to achieve the highest success rate (58%) among all local tertiary institutions. A total of 150 new projects were funded with a total amount of HK$76.643 million.

In addition to the Earmarked Grants, researchers at HKUST were successful in winning research funding from a variety of sources, demonstrating that the University has reached the level of an international as well as a national institution.

■ RGC's Cooperative Research Center (CRC) Program granted HK$9.646 million to support four university-industry collaborative research projects in the areas of advanced engineering materials, the Internet, liquid crystal display, and molecular biology. The CRC Program requires that each proposal must win a minimum of 20% supplementary funding commitment from industry.

■ Dr Qiang DU of the Mathematics Department was appointed Chief Scientist for the National "973" project on Large-scale Scientific Computation

■ 生物化學系張明傑博士聯同三藩市加
州大學的David Bredt教授和日本神經
研究所的Shinichi TAKEDA教授獲國
際著名的人類前沿科學計劃組織撥款
60萬美元(約468萬港元)，進行一項有
關一氧化氮生物作用的研究。

■ 在研資局與歐洲國家駐港領事館及歐
洲學術單位共同主辦的三個撥款計劃
中，科大學者取得令人滿意的成果：
20個獲法國/香港聯合研究計劃資助的
項目中，有10項來自科大；在英國/香
港聯合研究計劃方面，科大學者提交
五項申請，其中四項獲得資助；在德
國/香港聯合研究計劃方面，科大共有
六個新的研究項目獲得資助，另有三
個在上年度獲資助的項目再獲撥款。

創業支援計劃

科大在1999年7月推出科大教研人員創業
計劃；到了2000年2月，再在大學新翼成
立創業中心。這一年間，已協助數十位

香港工業總會主席唐英年先生主持創業中心開幕典禮。
Mr Henry TANG, Chairman of the Federation of Hong Kong Industries, inaugurated the University's Entrepreneurship Center.

Research by the Ministry of Science and Technology. The initial two-year budget for the project was RMB 13 million.

■ The NSFC/RGC Joint Research Scheme funded by the National Natural Science Foundation of China (NSFC) and the RGC offered HK$2.96 million and RMB1.44 million, respectively, to support work by researchers at HKUST and their partners in the Chinese Mainland in four advanced areas: nanostructure materials, microelectronics, optoelectronics, and marine and environmental science.

■ Dr Mingjie ZHANG of HKUST's Biochemistry Department, Prof David BREDT of the University of California, San Francisco, and Prof Shin'ichi TAKEDA of the National Institute of Neuroscience in Tokyo were awarded a grant of US$600,000 by the prestigious Human Frontier Science Program to undertake an international research project on the biological functions of nitric oxide.

■ HKUST researchers achieved very satisfactory results in competing for funding offered by the Joint Research Schemes sponsored by the RGC and local representatives of three European countries. Out of the 20 proposals funded by the France/Hong Kong Joint Research Scheme, ten came from HKUST. In the Britain/Hong Kong Joint Research Scheme, four out of five HKUST proposals received funding. In the Germany/Hong Kong Joint Research Scheme, six HKUST projects received support and three projects funded last year had their funding renewed.

HKUST Entrepreneurship Program

The HKUST Entrepreneurship Program was initiated

"南沙資訊科技園區" 第一期工程已經展開。
Construction work on Phase One of the "Nansha IT Park" has been underway.

科大教職員、校友和研究生創辦了18家科技公司。這些公司涉及的領域包括生物科技、消費電子、交通防撞設施、室內空氣質量調節、互聯網服務及微電子。

科大協助教職員、校友和學生創辦科技公司，不單把具有市場潛力的科研項目商品化；更重要的是通過這些公司，協助香港塑造一個適合高新科技發展的氛圍，並為科技人才提供更多就業機會。

研究及發展部正努力籌措更多資金，進一步推動創業家計劃和創業中心的發展。他們正與一家主要的創業投資基金公司洽議，為新成立的科技企業提供創業資金。

科大在深圳與北京大學和深圳市政府合辦的"深港產學研基地"，以及在番禺南沙與霍英東基金會合辦的"南沙資訊科技園區"也為有志創業的科大成員提供設施及人才招聘與培訓。

in July 1999, and the University's Entrepreneurship Center was officially opened in February 2000. During the year, the Program assisted a number of HKUST faculty and staff members, alumni, and postgraduates to establish a total of 18 start-up companies. The businesses of these start-ups cover a wide range of technological areas: biotechnology, consumer electronics, crash barriers, pharmaceuticals development, indoor air quality, Internet services, and microelectronics.

By taking the initiative to help HKUST members set up their own technology companies, the University not only enables the commercialization of research projects with market potential, but more importantly, assists Hong Kong in creating an atmosphere conducive to the development of high technology. The Program also provides more job opportunities for graduates with a technology background.

The University's Research and Development branch has been actively exploring additional financial resources to further develop the Entrepreneurship Program and the Entrepreneurship Center, including seeking support from major venture capital firms.

In addition, the "Shenzhen-Hong Kong Industrial, Educational, and Research Institution"* set up jointly by Peking University, HKUST, and the Shenzhen Municipal Government; and the "Nansha IT Park" established by the Fok Ying Tung Foundation and the University will also provide support to HKUST's entrepreneurial members in terms of facilities, space, and personnel recruitment and training.

* The Institution has been renamed the PKU-HKUST Shenzhen-Hong Kong Institution.